B.C. HYDRO

KELLY LAKE-NICOLA 500 kV TRANSMISSION LINE

PROJECT REPORT

IMPLEMENTATION OF ENVIRONMENTAL AND SOCIAL CONDITIONS

(CONSTRUCTION)

VOLUME I

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CONTENTS

VOLUME I

Section	Subject	Page
1.0	INTRODUCTION	
	(a) Purpose	
	(b) Project Description	
	(c) Project Application	
	(d) Project Approval, Conditions and Ministerial Orders	
2.0	ENVIRONMENTAL, SOCIAL AND ACCESS ASSESSMENT	
	(a) Environmental and Socio-Economic Assessment	
	(b) Environmental Commitments and Documentation	
	(c) Access Assessment and Development Plans	
	(d) Labour Force	
3.0	ADMINISTRATIVE PROCEDURES	
	(a) General	
	(b) Organization	
	(c) Environmental Pre-job Meetings	
	(d) Environmental Officer Reports	
	(e) Field Changes	
	(f) Project Steering Committee Meetings	
4.0	RESTORATION AND REVEGETATION	
5.0	"AS-BUILT" PROJECT DESCRIPTION	
6.0	CRITIQUE OF ENVIRONMENTAL INSPECTION/PROTECTION	
	(a) Adequacy of Assessment Information	
	(b) Effectiveness of Protection Plan	
	(c) Adequacy of Protection Documents	
7.0	DISCUSSION AND CONCLUSIONS	
	(a) Discussion	
	(b) Conclusions	

CONTENTS - (Cont'd)

APPENDICES

Appendix No.	
A	Transmission Line Location
B	Project Organization Chart
C	As-Built Logging/Clearing/Construction Schedule
D	Labour Force
E	Environmental Index Summary, Environmental Index Maps, Access Maps
F	Ministerial Dispositions, Orders, Amending Orders and Approvals
G	Right-of-Way Photographs
H	Summary of Commitments and Implementation

VOLUME II

Appendix No.	
I	"As Built" Strip Maps

1.0 INTRODUCTION

(a) Purpose

The purpose of this report is to review the environmental protection program used by B.C. Hydro for the construction of the Kelly Lake - Nicola 500 kV transmission line, to evaluate the effectiveness of the data and methods employed and to recommend improvements.

(b) Project Description

This project was the first of two 500 kV transmission lines to be constructed on a common right-of-way between Kelly Lake Substation near Clinton and Nicola Substation in the Merritt area. The location is shown on Appendix A.

The Kelly Lake to Nicola No. 1 transmission line is a "Mica" type, 3-phase, 4-bundle ACSR conductor, single circuit line of which approximately 90 percent of the 362 towers are guyed "V" lattice type and the remainder, rigid self-supporting types.

The transmission line strengthens and secures the transmission systems from the Peace and Columbia generation facilities. The line provides a capacity of 3500 MW for emergency power routing and can reduce power losses in the B.C. Hydro grid by approximately 5 MW.

Construction work was substantially complete in August 1984 and the transmission line was energized in September 1984. Minor construction and access road stabilization will be carried out in the summer of 1985 together with seeding and other restoration work. The forecast final direct cost of the project (excluding

interest during construction and corporate overhead) is approximately $29 million.

(c) Project Application

An application under Section 18 of the B.C. Utilities Commission Act for the construction and operation of the first line was filed by B.C. Hydro on 6 May 1981. B.C. Hydro made application for a right-of-way for two 500 kV transmission lines.

Environmental assessments, mitigation recommendations and B.C. Hydro's mitigation proposals were provided with the application in accordance with the information requirements pursuant to B.C. Regulation 388180.

(d) Project Approval, Conditions and Ministerial Orders

The application was reviewed by the Provincial Government under the Energy Project Review Process. Based on this review it was determined that the project would have minimal environmental and socio-economic impacts which could be managed through conditions.

Thus, on 29 October 1981, the Minister of Energy Mines and Petroleum Resources, with the concurrence of the Minister of Environment, ordered that the construction and operation of the transmission line be exempt from the provisions of Sections 20 and 21 of the Utilities Commission Act and that the construction and operation of the project proceed subject to Terms and Conditions. This approval established a Project Steering Committee (PSC) to ensure compliance with these Terms and Conditions.

Resolution of regulatory requirements concerning the need to apply for a Certificate of Public Convenience and Necessity was made in

an Amending Order of the Ministers on 5 February 1982. This resolution permitted preliminary field work to proceed.

On 11 March 1982, the Minister for the Provincial Secretary and Government Services issued an Order under Section 7(2) of the Heritage Conservation Act requiring a Heritage Resource inventory investigation.

On 14 October 1982, the Minister of Energy, Mines and Petroleum Resources and the Minister of Environment issued an approval for the right-of-way clearing specification (HA-8059) for the section from km 105 to 138.

On 5 November 1982, the Minister of Energy, Mines and Petroleum Resources and the Minister of Environment issued an approval for the right-of-way clearing specification (HA-8066) for the section from km 62 to 104.

On 14 January 1983, the Minister of Energy, Mines and Petroleum Resources, and the Minister of Environment, ordered a change to the right-of-way clearing specification (HA-8059) for section km 105 to 138. This removed winter working restrictions, subject to snow conditions.

By Amending Order No. 2, dated 10 February 1983, the Minister of Energy, Mines and Petroleum Resources, with the concurrence of the Minister of Environment, approved the Hat Creek Bypass relocation, and delegated to the PSC authority to impose details of further environmental and social conditions for the project's construction and operation.

On 9 November 1983, the Minister of Energy, Mines and Petroleum Resources, and the Minister of Environment, ordered a change to the

right-of-way clearing specifications (HA-8059 and HA-8066) for section km 62 to 138. This change permitted stump retention.

On 18 February 1985, the Minister of Energy, Mines and Petroleum Resources, with the concurrence of the Minister of Environment issued Amending Order No. 3 which specified conditions for the completion of construction (primarily right-of-way restoration) and operation of the project, including requirements for annual reporting by B.C. Hydro and emergency operation procedures.

Copies of Ministerial Dispositions, Orders, Amending Orders and Approvals are included as Appendix F.

2.0 ENIVRONMENTAL, SOCIAL AND ACCESS ASSESSMENT

(a) Environmental and Socio-Economic Assessment

Pre-application environmental assessment studies were carried out in accordance with the Guidelines for Linear Development (1977) of the Environment and Land Use Committee (ELUC). Terms of Reference for these studies required compilation of resource inventories and recommendation of preferred routes and mitigation measures for the design, construction and operation of the transmission line. The environmental documentation included:

1. Phase I Corridor Evaluation Studies, Ian Hayward and Associates Ltd., November 1976 - a study of route alternatives and a recommendation of the preferred route.

2. Phase II Route Selection Study, Ian Hayward and Associates Ltd., May 1980 - a study of access roads, climate, geology and mining, hydrology, terrestrial resources and fish and aquatic habitat. The study also included land use, a visual

analysis and recommendations for vegetation management and mitigation.

3. Heritage Resource Impact Assessment of a 20 km Segment, Aresco Ltd., June 1982 - an archaeological inventory and impact assessment.

4. Environmental Review of the Hat Creek Bypass, B.C. Hydro, November 1982 - a review of fisheries, agriculture, forestry, wildlife, heritage resources, land use, visual resources and certain sensitive locations (Maiden Creek Basin, Hat Creek Basin, Bonaparte River Valley, Arrowstone Hills).

5. Heritage Resource Inventory and Impact Assessment of the Hat Creek Bypass, E. Jane Warner and I.R. Wilson Consultants Ltd., May 1983.

(b) Environmental Commitments and Documentation

Environmental protection commitments were based on the environmental assessment studies and field knowledge. The PSC directed B.C. Hydro to prepare documentation and specifications to implement mitigation measures. This documentation was the basis for environmental protection during clearing and construction and also will be used during operation. Documentation included: 1) site specific Environmental Index Maps, 2) an Environmental Index Summary, 3) Access Assessment and Development Plans, and 4) clauses in clearing and construction contract documents (including Annotated Strip Maps). The strip map format normally used by B.C. Hydro was revised to shown heritage site locations and other protection specifications. An Environmental Procedures Manual was also prepared at the PSC's direction to outline administrative procedures and general protection practices for transmission line

development. The manual was completed to the PSC's satisfaction prior to completion of construction.

Appendix E provides Environmental Index Summary, Environmental Index Maps and Access Maps.

Mitigation commitments were made relating to: construction scheduling, access development and control, stream crossings, clearing standards, heritage sites, fish and wildlife (including rattlesnakes), agriculture, forestry, private land and ranching leases and site restoration. Implementation of these commitments has been successful with the exception of ten minor heritage sites disturbed during construction.

(c) Access Assessment and Development Plans

Construction roads were permitted and constructed on approved alignments, based on the Access Assessment and Development Plans throughout most of the right-of-way. One exception occurred at km 114 at the divide of the Surrey Lake and Nicola drainage. Local residents requested that B.C. Hydro avoid access road construction to limit public access to ranch lands and a fishing resort. This change was made based upon a presentation to the PSC by local ranchers and the fishing resort operator.

B.C. Hydro Operations has assessed the construction access roads and established their long-term requirements for maintenance purposes. This long term access plan has been submitted to the PSC for their review and concurrence.

(d) Labour Force

Work started on the project in November 1982. Clearing and construction continued through August 1984 except during December

1983 and January 1984. The labour force peaked in September 1983 at approximately 100 persons when logging/clearing, foundation installation and tower erection were in progress. Appendix D illustrates the work force for the various categories of work during the progress of the project.

The work force consisted primarily of equipment operators, linemen, carpenters, drillers and labourers. The largest proportion of the work force was qualified IBEW workers, particularly during the construction stage.

Logging/clearing work was performed by Pooley Bros. Ltd., Coast Utility Services Ltd., and Lau Bat Logging Co. Ltd. Foundation installation, tower erection and conductor installation was performed by B.C. Hydro's own forces and by Comstock International Ltd., the latter working under two separate contracts. Numerous local contractors performed work as subcontractors, particularly during the logging and clearing operations.

Of the logging and clearing workers, approximately 90 percent commuted from their homes in the area. Ten percent resided in local motels and hotels. Of the construction workers, approximately 70 percent resided in motels and hotels, particularly in the Cache Creek, Ashcroft, Logan Lake and Merritt areas, and 30 percent resided at home. Other than revenue from board and accommodation, the labour force did not affect local communities.

3.0 ADMINISTRATIVE PROCEDURES

(a) General

B.C. Hydro's objective was the timely and economic construction of the project to modern engineering standards with a minimum of

environmental and social disturbance. The project was constructed in accordance with the Conditions of the joint Ministerial Orders, the detailed conditions imposed by the PSC and the applicable laws of the province of British Columbia.

(b) Organization

Those most involved in the construction stage were B.C. Hydro; the PSC; Provincial Government Departments, Ministries and Agencies; logging/clearing, construction and material supply contractors; and property owners.

The PSC, under the chairmanship of the Thompson-Okanagan Regional Resource Management Committee (RRMC) Chairman, or his designate, monitored compliance with the Conditions and requirements of the Ministerial Dispositions, Orders and Amending Orders. The PSC recommended and approved clearing and construction specifications and established environmental and social requirements. Representation included the Ministry of Forests, Ministry of Agriculture and Food, Ministry of the Environment - Fish and Wildlife Branch, Heritage Conservation Branch (Ministry of Provincial Secretary and Government Services), and B.C. Hydro.

In 1983 the RRMCs were disbanded. Chairmanship of the PSC continued through the same Ministry of Environment office of the Southern Interior Regional Director in Kamloops. The Project Organization Chart (Appendix B) shows the interrelationships among the various working groups on the project.

Within B.C. Hydro, the project was organized on a matrix project management basis. Administrative responsibility for the project was vested in the Project Manager who led a multidisciplinary team from various functional departments within B.C. Hydro. The Project Manager represented B.C. Hydro on the Kelly Lake-Nicola Project

Steering Committee, and was responsible for the overall control of the project, the expenditure of money and schedule.

In the field, logging/clearing and construction work was supervised by a Resident Project Superintendent. An Environmental Officer (EO) was assigned to the Project Superintendent's staff for the duration of the project. The EO was responsible for preparation of the Environmental Index Maps and Summary and for compliance with the environmental aspects of specifications and other mitigation measures. He also ensured all environmental concerns were addressed and resolved. The EO prepared weekly inspection reports during construction and was requested to present summary reports at PSC meetings.

Three Land Representatives had assignments on the project, working on an "as-required" basis. They dealt with private property owners, lessors, mineral claim holders, contractors and certain government agencies in regard to specific land matters.

(c) Environmental Pre-job Meetings

During the tendering stage of each contract, environmental assessment information was given to prospective contractors to make them aware of environmental matters and to emphasize its importance. This information included: Access Assessment Report, Transmission Line Projects Environmental Procedures Manual, Environmental Index Maps, Index Summary, strip maps, preliminary structure data sheets and profiles, a property Line List and a Hazard List.

After contract award and prior to the start of work on each contract or phase of work, a field pre-job meeting was held. One purpose of the pre-job meeting was to emphasize specific environmental and social requirements. Pre-job meetings in the field were

held by the EO with the contractor or Hydro Force Construction, B.C. Hydro's field staff and local resource agency personnel directly concerned with the work.

Local ranchers near Nicola provided a letter to B.C. Hydro stating their concern about weed infestation and its potential to damage grazing lands. Copies of this letter were distributed by B.C. Hydro to each contractor and the ranchers were given the opportunity to address construction workers to emphasize their concerns.

(d) Environmental Officer Reports

The Environmental Officer produced weekly environmental inspection reports entitled "Report on Environmental Matters". These reports described the areas of work, the kind of work carried out, any environmental concerns and action taken. In addition, the EO produced an interim report in February 1984 which summarized B.C. Hydro's environmental protection commitments, the status of implementation, and provided suggestions for improvement of environmental protection on the project. A copy including some minor additional information is attached as Appendix H.

(e) Field Changes

Where field changes from the approved specifications were necessary to provide specific environmental protection, the EO and a delegated representative of the Project Steering Committee (usually the Regional Fish and Wildlife Habitat Protection Biologist) discussed each revision. If the change was deemed "minor" and was agreeable to both parties, the change would be implemented in the field and reported to the PSC. If a "major" change was proposed, it was submitted to the PSC for review and approval. PSC meeting minutes record these revisions.

(f) Project Steering Committee Meetings

The PSC held meetings periodically to discuss the implementation of Conditions of the Ministerial Dispositions and Orders. The PSC reviewed and approved clearing and construction contract documents, the Environmental Procedures Manual and other documentation, imposed environmental and social conditions and requirements and approved changes.

4.0 RESTORATION AND REVEGETATION

Restoration and revegetation were initiated during construction. These reclamation activities will continue, as required,with the completion of construction. This work was in accordance with the Ministerial Orders and B.C. Hydro policy. The objective of the restoration program was to achieve a stable, aesthetically acceptable right-of-way with a vegetation cover that is easy to maintain and compatible with adjacent land uses.

Major restoration activities included cleanup of debris, recontouring and revegetation of work sites, crane pads, anchor trails, puller/ tensioner sites and temporary roads to be retired. Some restoration was undertaken as routine construction practice. Other measures were non-routine and were carried out as extra work requested by B.C. Hydro.

Revegetation was customarily carried out under separate contract. Initial seeding generally took place during the first suitable planting season after clearing. Seed mixes, fertilizers, application rates and areas for revegetation were approved by the PSC following review by the Ministries of Agriculture and Forests. Appendix H provides details.

Appendix G, Right-of-Way Photographs, illustrates the condition of the right-of-way in the summer of 1984.

5.0 "AS-BUILT" PROJECT DESCRIPTION

The project was built in accordance with the approved plans and conditions. A change from the originally approved project was the Hat Creek Bypass. Lesser changes which received PSC approval were necessitated by the location of heritage sites or topography. In response to Ministry of Transport requirements, aerial markers were used on the transmission line at Highway 1. These markers increased the visual impact at that crossing.

Sixty-nine minor tower relocations were made over the entire transmission line from the locations shown on the original Strip Maps. Such changes were necessitated by site conditions. The original structure locations were based on preliminary survey and ground data obtained prior to clearing. Some site data, for example, was obtained during winter conditions and later required revision.

Final structure locations were determined in 1983 before logging and clearing was complete. As a consequence, minor changes were made to avoid rock outcrops, swamps and to increase conductor clearance. Other changes were made to implement economy measures such as tower elimination or size reduction. Design changes were also made to optimize and ensure security and safety.

Appendix I presents "as-built" Strip Maps which document field changes.

6.0 CRITIQUE OF ENVIRONMENTAL INSPECTION/PROTECTION

(a) Adequacy of Assessment Information

The environmental and socio-economic assessments provided adequate resource data and mitigation recommendations upon which to base most protection measures. The practical requirements of field

protection however revealed certain limitations in the use of this material.

For example, heritage resource site significance and site boundaries need to be reviewed and agreed upon with the Heritage Conservation Branch (HCB) prior to the preparation of clearing and construction contracts. This review was completed after the strip maps were drawn and annotated with heritage site boundaries based on assessment reports. Subsequent field inspection by the HCB resulted in revised site boundaries and more specific field protection procedures. Field protection measures attempted to avoid route changes by simply preventing or minimizing site disturbance on the right-of-way. This approach reduced B.C. Hydro's costs for heritage mitigation considerably and still preserved heritage sites for future analysis.

Timing constraints on winter clearing recommended in assessment reports to protect winter range moose proved unnecessary. A mild winter and light snowfall never caused moose to move onto their winter range. Because of this, protection measures were re-specified in terms of snow depth - a more operational and practical criterion.

(b) Effectiveness of Protection Plan

The environmental inspection/protection plan was successful to the extent that all requirements and commitments were met. The most notable result of the plan was the use of coordinated access which met contractors' needs during construction and B.C. Hydro's for operation. Coordinated access reduced road building costs, avoided unnecessary ground disturbance and attendant tower site instability problems, lessened stream crossing impacts and reduced visual impacts of the right-of-way.

Environmental inspection was effective. With the exception of ten heritage sites, accidentally disturbed when unexpected activity occurred in the area, most mitigation commitments were implemented successfully. Disturbance of heritage sites resulted from inadequate flagging of sites which were presumed safe. In retrospect, it would have been better to fence these exclusion areas and to provide larger buffer zones. Fencing, together with signs posted to state that entry into an (heritage) area is only with the permission of the Resident Project Superintendent or the Environmental Officer could be used to provide additional protection. Such signs should give local telephone numbers of these project personnel.

On-site pre-job meetings with regulatory agencies, land owners, contractors and B.C. Hydro field staff were essential. In this forum, all concerns, public and private, and special contract requirements were highlighted and the method of protection or field procedures were discussed. It is essential that contractors and their crews are aware of environmental commitments and the role the Environmental Officer plays in implementing those commitments. It is also essential that contract foremen directly pass this information to equipment operators together with the reason(s) for various requirements.

Continual liaison with the PSC designate was as important as communication with the contractor, especially when specific concerns were identified. On this project, this close working relationship in the field improved B.C. Hydro - agency confidence and provided more effective and flexible field administration.

It is particularly important to have adequate inspection during the more disruptive activities such as road construction, logging, clearing, foundation installation and the preparation of crane pads and puller/tensioner sites. During these activities it is

advantageous to have all site staff aware of commitments and sensitive sites throughout the construction area. If road construction, for example, is going on in two or three sensitive locations at once, adequate environmental inspection by one person becomes difficult, if not impossible.

Because of the foregoing, it is recommended that all field staff be made aware of environmental concerns and requirements in the areas they are working. Any complex environmental problem arising during construction must be referred to the EO for resolution.

(c) Adequacy of Protection Documents

(i) Environmental Index Summary

The Environmental Index Summary was used primarily by the EO, Resident Project Superintendent, Land Representatives and Clearing and Construction Supervisors. Contractors relied more on the detail specifications in the contract documents however for later contracts, the Environmental Index Summary was available in the "viewing package" during the tendering process.

The Environmental Index Summary was compiled from primary references and was used as a reference for more specific documents. It summarized environmental concerns and agreed mitigation measures from consultant reports, pre-construction field investigations, property owner agreements, and conditions to project approval.

The most frequently used information in the Environmental Index Summary was data on stream locations, access restrictions and heritage sites. Although requirements governing wildlife, fisheries and visual impact were also covered, it

was not usually necessary to refer to them on a daily basis. The Environmental Index Summary was used as a checklist before going into a given area.

Some issues, such as construction timing constraints for wildlife, were written in the contract schedule; other requirements, for example, on retention of browse, were addressed through clearing and construction standards.

Critique

"Commitment and Resource Information List" is possibly a better name than Environmental Index Summary because this document collates the commitments to be implemented, cross references them to the source, summarizes sensitivities and constraints, indicates mitigation actions proposed and serves as a checklist for mitigation measures implemented.

Commitments, mitigation and construction activity restrictions were reasonably accurate when compared to the actual conditions experienced and final mitigation measures implemented. Examples of accurate and useful Environmental Index Summary data are stream and heritage site locations, Agricultural Land Reserve boundaries near Nicola and winter range boundaries near the Thompson River and in the Nicola Valley. An example of poor Environmental Index Summary data was the incorrect identification of erodible soils near Minch Creek. Minch Creek soils were comprised, in fact, of broken rock which was excellent for road construction and proved very stable.

The Environmental Index Summary should be prepared and updated as planning, design and construction proceed. It should be distributed to the project and regularly updated on a formal

project basis. All environmental inspection documents should be produced from the Environmental Index Summary (not vice versa).

Because the greatest disturbance caused by transmission lines occurs during right-of-way clearing and access road construction, constraints imposed on these activities must be carried forward to the Strip Mapswith references in the Environmental Index Summary available in the viewing package during the tendering of each contract.

Commitments in the Environmental Index Summary must be enforceable under the contract. Ideally, important aspects (i.e. any requirements which would affect a contractors costs or schedule) of the Environmental Index Summary must be included within the contract text. Alternatively, the contract should refer to the appended Environmental Index Summary in its entirety.

(ii) Environmental Index Maps

The Environmental Index Maps were used by B.C. Hydro field staff and contractors' staff. Environmental Index Maps displayed the information in the Environmental Index Summary on an aerial photo mosaic base. It provided a pictorial checklist of environmental matters, construction activities and mitigation along the right-of-way.

Environmental Index Maps were used at the beginning of contracts for meetings and periodically during construction. They were useful as a visual checklist and to discuss environmental protection matters with those not involved in the daily conduct of the project.

Although not usually taken to the work site, they were displayed on construction office walls to give "the overall picture". On this project the scale was too small for daily detail work.

Critique

Environmental Index Maps have limited field usefulness due in part to their large size and small scale. They were useful for discussion among contractors, resource agencies, land owners and others.

For routine use by inspection staff and contractors they are less effective than Strip Maps and are virtually useless if the photo mosaic reproduction or scale is poor. It is also noted that the information contained in the Environmental Index Maps is also contained in the Environmental Index Summary, annotated Strip Maps, aerial mosaics, route plans and Access Development Plans.

In view of the above, it is suggested that larger annotated Strip Maps, with more detail and off right-of-way access information be used in conjunction with the other documentation.

If Environmental Index Maps continue to be used, they should be part of tenderers' viewing package as reference material. They should be part of the contract only if they are consistent with all other documentation in the contract and should be revised to reflect revisions as the work proceeds.

(iii) Strip Maps (annotated with resource information)

Annotated Strip Maps were used by B.C. Hydro field staff, contractors, and resource agencies such as the Fish and Wildlife Branch and the Heritage Conservation Branch. They depicted clearing standards, road locations, property boundaries, fence lines and sensitive areas (streams, soils and heritage sites). Although there was some overlap with the Environmental Index Maps this was not a problem because the information was presented consistently.

Information on the Strip Maps was useful and practical for field use; clearing standards to be followed by clearing contractors were defined; merchantable timber boundaries, road locations and decking sites were used by cat operators and loggers; heritage site boundaries and creeks were clearly depicted, approximate tower locations were used by foundation, assembly, erection and stringing crews for access. The information was used daily. The Strip Maps were also an ideal medium to record field notes including as-built access locations and clearing standards. They were used in the field by both contractors' and B.C. Hydro staff to carry directives to the site.

Critique

The Strip Maps were the most workable documentation produced for field personnel. Scale and detail were convenient and their format lent itself to binding in hardcover to withstand field conditions.

Strip Maps were a part of the contract documents. Revisions to the strip maps were made as the work progressed. As a result, the drawing revision status should be clearly

indicated. Strip maps should not be used for construction purposes until all relevant information is annotated on the maps. They should then be "construction issued". Ample lead time in the preparation of the Strip Maps is important; this requires early field work and design.

Changes and additions to the Strip Maps during construction could lead to contractors' extra costs or claims against B.C. Hydro if the contractor has not allowed for the changes in his bid. Changes to Strip Maps during construction should follow normal drawing management procedures. They should be initiated by the Resident Project Superintendent who would advise his staff and contractors accordingly.

Kelly Lake x Nicola was the first B.C. Hydro project to treat Strip Maps as "construction issue" during foundation installation, tower erection and conductor stringing. These drawings provided information on specific environmental requirements such as access restrictions and heritage site exclusion areas which previously would have only been included with the clearing contract documents.

Strip Maps were updated periodically during construction. However, because the drawings were not formally controlled construction issues, revised copies were not provided to field staff as often as they should have been. Most failures to protect heritage sites can be traced to this lack of drawing control. These problems were compounded due to the Hat Creek Bypass relocation because heritage sites were being identified and mitigation planned during the clearing phase of the relocated right-of-way. They would have been minimized if heritage sites had been identified, mitigation specified and the locations drawn on Strip Maps prior to tendering, as would normally be the case.

Annotated Strip Maps are developed with input from a variety of sources including the environmental assessment reports, properties information and the terms and conditions of project approval. Accurate records should be kept of when and from whom information is received and added. Revisions should be circulated to recipiants on a standard distribution with an instruction to destroy old copies.

Copies of all as-built documentation have not normally been sent to Electrical Operations after a line has been commissioned. This practice has varied on some projects in the past. End-of-Job Reports sent to Electrical Operations should include final Strip Maps, Environmental Index Maps and, most importantly, the Environmental Index Summary, to ensure continuity of environmental protection through the operation phase.

(iv) Contract Documents

All specific environmental requirements appeared as clauses in the contract documents. These specified the work, constraints and other requirements. Requirements for access breaks and construction restrictions appeared in the contract whereas routine stream crossings which are best solved on site were not included.

In general, any environmental protection requirements likely to incur non routine costs would appear in the contract (e.g. a bridge). Requirements which are routine and that do not involve extraordinary or unanticipated costs are dealt with on site specifically at no extra cost (e.g. routine culvert installation). However, extra work items during construction should be minimized as they could be used as cause for claims against B.C. Hydro. On the Kelly Lake-Nicola project no claims were made by contractors.

CONTENTS OF APPENDIX F

MINISTERIAL DISPOSITIONS, ORDERS, AMENDING ORDERS AND APPROVALS

Disposition Order 29 October 1981
Amending Order No. 1, 5 February 1982
Order (Heritage Conservation Act) 11 March 1982
Approval (Clearing Specification km 105-138) 14 October 1982
Approval (Clearing Specification km 62-104) 5 November 1982
Specification Change (Clearing km 125-138) 14 January 1983
Amending Order No. 2 (Hat Creek Bypass Modification) 10 February 1983
Specificaiton Change (Clearing km 62-138) 9 November 1983
Amending Order No. 3 (Completion of Construction & Operation) 18 February 1985

(v) Environmental Officer's Inspection Reports

Weekly environmental inspection reports briefly summarized construction activities, compliance/non-compliance, meetings, observations, recommendations for corrective action and actions taken. The reports were not construed as construction progress estimates. The frequency of the reports should vary depending on the type of project, work progress and environmental complexity. Internal B.C. Hydro copies should be sent to the Project Manager, and appropriate functional departments.

7.0 DISCUSSION AND CONCLUSIONS

(a) Discussion

Kelly Lake-Nicola 500 kV transmission line project was B.C. Hydro's first regulated linear project. It was also the first regulated project with a multi-government agency Project Steering Committee. In addition, it was the first major transmission line on which B.C. Hydro performed the logging. Other new requirements included pre-engineering the access roads, production of an Environmental Procedures Manual, Environmental Index Maps, Environmental Index Summary and weekly environmental inspection reports.

In mid 1982, approximately 9 months after project approval, the Hat Creek Thermal was deferred indefinitely. This deferral initiated the relocation of a 36 km section of transmission line around the Hat Creek Valley. The relocation necessitated preparation of an Environmental Assessment Review which was given PSC and full government agency review.

Despite the many new conditions and environmental protection requirements, the project was completed ahead of schedule, (in 22 months vs. a normal 4 years) at a cost substantially below budget and with no claims related to the work.

Kelly Lake-Nicola 500 kV transmission line was the first project approved under a new regulatory process. It is not surprising that the project was subject to some unexpected delays, particularly in the initial stages before the commencement of logging and clearing in October 1982. Nevertheless, and despite the requirements for new environmental documentation, the overall project was well controlled and project goals were achieved.

Work was accelerated to meet the required in-service date by combining the logging and clearing in composite contracts and by permitting some seasonal overlap of foundation installation and tower erection, and tower erection and conductor installation (see As-built Construction Schedule, Appendix C).

In the judgement of the Project Manager, this acceleration would normally result in minor additional costs to B.C. Hydro. However, any such additional costs were offset by the benefit of later contract award dates in an economic climate of de-escalating contract prices.

The accelerated logging/clearing/construction work progressed in an orderly manner within the tight construction schedule and was completed ahead of schedule.

The requirement that B.C. Hydro deck logs, for subsequent sale by the Ministry of Forests (MOF), resulted in additional costs to B.C. Hydro. These added costs were a result of the generally poor timber quality and unfavourable market conditions.

From B.C. Hydro's point of view, the disposal of the merchantable timber (including sorting, loading and transportation) should be under the control of B.C. Hydro. This would minimize costs, reduce right-of-way and access road disturbance and provide better defined responsibility for activities on the right-of-way.

Because of the need to develop new logging/clearing specifications combined with other requirements, the call and award of logging/clearing tenders was delayed until late summer of 1982. As a result, work could not start on the right-of-way until November, 1982. Work continued through most of the winter of 1982/83. Clearing under winter conditions (frozen ground) resulted in stumps being left in the ground. This change from specified stump removal was not detrimental from an environmental point of view. Revisions have subsequently been made to B.C. Hydro's clearing standard specifications and the methods used to achieve them to allow for such field variations and flexibility on future projects.

(b) Conclusions .

1. It is the opinion of the Project Manager that the delegation of authority from the Ministries to the PSC increased the flexibility to manage field changes, particularly "minor" changes which could be undertaken subject to the mutual agreement of the Environmental Officer and the PSC delegate.

   The Amending Order assigning project responsibilities to specific government agencies (i.e. through the PSC) was beneficial because it necessitated performance on the part of the agencies as well as B.C. Hydro. It identified individuals in the agencies that B.C. Hydro could work with during the course of construction. This is in contrast to past situations in which a project dealt with a wide range of government personnel who lacked a "project" responsibility.

2. Regardless of the lead time available, flexibility to respond rapidly to changes during logging, clearing and construction is essential to the effective management of project work. Flexibility is necessary for environmental protection as well as to accomodate construction changes and to minimize delays and extra costs. Additional time should be allowed for unforeseen geotechnical conditions and site-specific factors, contractual matters and regulatory requirements. This additional time would allow B.C. Hydro to have greater flexibility in managing the work including necessary field changes.

3. All environmental and social requirements were effectively managed to provide environmental protection. With a few minor exceptions, all measures and commitments were successful. The tight schedule was met including changes in connection with the work to bypass the Hat Creek Valley.

   Now that these practices have been tried and found practicable on this transmission line they have been used to manage the environmental and social concerns on other transmission line construction projects.

4. Co-operation from government agencies during the course of the work was excellent. This co-operation resulted in a speedy review and approval of B.C. Hydro's relocation amendment request to the Minister of Energy, Mines and Petroleum Resources and enabled the Hat Creek Bypass to proceed without affecting the in-service date of the project.

5. Given the level of regulation of this project, the number of commitments made and the ongoing development of the environmental inspection/protection program, we conclude that the program has been successful in protecting the environment and

enhancing B.C. Hydro's working relationship with government agencies, as well as with private interests. It is suggested that future projects be planned and executed with due respect for environmental and social issues provided the preparatory work is carried out in advance of the construction stage.

APPENDIX

NOT FILMED

MAPS NOT

FILMED

CARTES

OMISES